

or preferably downward angle, e.g., 45° , to the horizontal to prevent particle sifting into the sparger. The downwardly directed gas from the sparger turns in the discharge tube in an upwardly direction towards the bed. The pressure drop through the sparger has to be at least thirty percent of the pressure drop through the whole bed; that is the differential pressures measured between the bottom and top of the bed. The flow rate through the sparger is designed to provide a conducive fluidizing condition to allow segregation and passage of larger agglomerates while forcing the bed particles and finer agglomerates back into the reaction region to minimize the overall residue. The presence of the sparger 30 creates a separate fluidized bed in the discharge tube 18. Operation of the discharge tube 18 at a fluidizing velocity 1.2 to 1.5 times the minimum fluidization velocity of the larger agglomerates to be separated will allow segregation and passage of the larger agglomerates for withdrawal. This is a well-known principle in fluidized bed operation.

The lower portion of the housing 12 forms a plenum 28 which connects through an orifice plate 29 to gas conduits 26 which communicate with the gas orifices 24 within a distribution or conical diffuser plate 16 at at least two spaced elevations and preferably three spaced elevations "a", "b" and "c" as shown in this embodiment. Though only shown on one side, for purposes of illustration, the orifices at each of the three elevations are spaced circumferentially around the distribution plate 16 and preferably the jets at each of the elevations are not aligned. Approximately 65% of the chlorine is distributed through the orifices 24. In this embodiment there are four orifices positioned equidistantly around the lower elevation "a" of the distribution plate and eight orifices equidistantly distributed around the distribution plate at each of the other two elevations. Preferably, the orifice 24 directs the chlorine gas at a slight angle downward to the horizontal, e.g., 10° , to prevent sifting of the powder into the orifices. The orifices are sized and the gas flow from the orifices are designed to allow the orifice jets to penetrate to the middle of the reactor 10. The pressure drop through the orifices are at least 30% of that across the entire bed. Those orifice jets entrain powder and gas continuously and eventually degenerate into bubbles and promote intensive gas and solids mixing and contacting. This design is particularly effective for cohesive powders which cannot be fluidized conventionally. Individual control of each of the orifices 24, as figuratively represented by the controller 27, to adjust flow, provides exceptional operational flexibility. Preferably, all the surfaces of the reactor that contact the gas are constructed from materials such as graphite as previously mentioned or stainless steel, that can withstand the corrosive characteristics of

A2 chlorine. Though the embodiment shown in Figure 1 identifies the number of orifices and the number of jet elevations, the design will be different depending on the size of the chlorinator. In all cases, however, the design will follow the fluidization and gas/solids contacting principles described in this disclosure and will include at least two elevations of jets directing a fluidizing gas directly into the bed.

A3 A pilot reactor was designed for cold flow simulation of this invention. It was found that the large central jet or tube 22 enhances the solid circulation and mixing inside the bed, and promotes a solid flow pattern conducive to agglomeration of impurities. The intensive solids mixing produced by the central jet 22 and the peripheral orifices 24 provides a more uniform temperature in the bed and improves production. In this test, the upper diameter "d" of the bed was approximately 10 inches (25.4 centimeters) and narrowed at its conical lower portion "g" to 4 inches (10.2 centimeters). A 0.5 (1.27 centimeters) inch diameter graphite pipe was employed for the central jet 22 and the orifices in the distribution plate were located 2, 4 and 6 inches above the residue discharge conduit or collection tube 18 and were 0.0787 inches (2 millimeters) in diameter. The slope "f" of the distribution plate 16 was approximately 70° to the horizontal. These relative dimensions can be employed to scale the design from a pilot model to a production reactor size. Accordingly, this invention enables a continuous reaction to be sustained within the fluidized bed without clogging of the bed and enables either continuous or on-line batch removal of the process residue.

In the claims:

Please cancel Claim 11

1. (Amended) A fluidized bed reactor for mixing a plurality of raw materials and transforming a chemical property of the raw materials to establish a desired product comprising:

A4 a hollow, elongated, vertically oriented reactor housing for confining a reaction of the raw materials as they are transformed, a portion of the reactor housing confining the reaction of the raw materials defining a reaction zone;

a central gas and/or solids inlet proximate the bottom of the reaction zone within the housing for directing gas and/or solids in an upward direction along the vertical axis of the housing into the reaction zone without passing through a solid or perforated diffuser section to maintain the raw materials in suspension; and